RAND

Tools for 21st Century Diplomacy:

An Approach to Improved Information and Communication Technology for Romania's Foreign Affairs Ministry

Tora Bikson, Robert Anderson, Robert Hunter

MR-1567-TDA

May 2002

This report was funded by the U.S. Trade and Development Agency (TDA), an export promotion agency of the United States Government. The opinions, findings, conclusions, or recommendations expressed in this document are those of the author(s) and do not necessarily represent the official position or policies of TDA.

Mailing and Delivery Address: 1621 North Kent Street, Suite 200, Arlington, VA 22209-2131
Phone: 703–875–4357 • **Fax:** 703–875–4009 • **Web site:** www.tda.gov • **email:** info@tda.gov

The research described in this report was sponsored by the U.S. Trade and Development Agency (TDA).

ISBN: 0-8330-3201-1

Published 2002 by RAND
1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138
1200 South Hayes Street, Arlington, VA 22202-5050
201 North Craig Street, Suite 102, Pittsburgh, PA 15213-1516
RAND URL: http://www.rand.org/
To order RAND documents or to obtain additional information, contact Distribution Services: Telephone: (310) 451-7002; Fax: (310) 451-6915; Email: order@rand.org

RAND

Tools for 21st Century Diplomacy:

An Approach to Improved Information and Communication Technology for Romania's Foreign Affairs Ministry

Tora Bikson, Robert Anderson, Robert Hunter

MR-1567-TDA

May 2002

This report was funded by the U.S. Trade and Development Agency (TDA), an export promotion agency of the United States Government. The opinions, findings, conclusions, or recommendations expressed in this document are those of the author(s) and do not necessarily represent the official position or policies of TDA.

Mailing and Delivery Address: 1621 North Kent Street, Suite 200, Arlington, VA 22209-2131
Phone: 703–875–4357 • **Fax:** 703–875–4009 • **Web site:** www.tda.gov • **email:** info@tda.gov

THE U.S. TRADE AND DEVELOPMENT AGENCY

The U.S. Trade and Development Agency assists in the creation of jobs for Americans by helping U.S. companies pursue overseas business opportunities. Through the funding of feasibility studies, orientation visits, training grants, conferences, and various forms of technical assistance, TDA enables American businesses to become involved in the planning stages of infrastructure and industrial projects in middle-income and developing countries. By doing this, the agency provides American firms with market entry, exposure, and information, helping them establish a position in markets that are otherwise difficult to penetrate.

Mailing and Delivery Address: 1621 North Kent Street, Suite 200, Arlington, VA 22209-2131
Phone: 703–875–4357 • **Fax:** 703–875–4009 • **Web site:** www.tda.gov • **email:** info@tda.gov

RAND

RAND is a nonprofit institution that helps improve policy and decisionmaking through research and analysis. Chartered in 1948, RAND has helped solve a wide range of critical problems in North America, Eurasia, East Asia and the Middle East, in addition to Europe. RAND has three principal U.S. locations, Santa Monica, California; Arlington, Virginia (just outside Washington, D.C.); Pittsburgh, Pennsylvania.

RAND *Europe*

RAND Europe is an independent think tank that serves the public interest by improving policymaking and finding public-private solutions to shared problems. Its work is objective and multi-disciplinary. RAND Europe helps European governments, institutions, and firms with rigorous, impartial analysis of the hardest problems they face. By disseminating analyses and ideas, RAND Europe also informs public debate. RAND Europe is networked with other European organisations, including Solving International (France), Bohlin & Strömberg (Sweden), Abels and Grey (Germany), IABG (Germany), and leading universities. RAND Europe headquarters are in Leiden, The Netherlands. RAND Europe also has offices in Berlin, Germany, and Cambridge, the United Kingdom.

PREFACE

This report outlines an approach to information and communication technology modernization for Romania's Ministry of Foreign Affairs. As a preliminary needs assessment and feasibility study, it is intended to lay the foundation for future modernization stages, including the development of a detailed system design and subsequent system implementation.

The project was carried out over a 5-month period, from January 15 to June 15, 2001, with support from the U.S. Trade and Development Agency. The Ministry of Foreign Affairs of Romania was the project client, with RAND acting as the contractor.

The study was housed within RAND/Europe's European Defense program of research, headed by Stuart Johnson. The program's mission is to provide high quality research and analysis on issues of importance to allies and partners of the United States. RAND is a private, nonprofit research institution, conducting policy research in the public interest.

EXECUTIVE SUMMARY

INTRODUCTION

Information gathering, analysis, interpretation, decisionmaking and dissemination--as well as the documentation of these actions--must be treated as critical business processes by government entities in the 21st century. According to a statement released by the United Nations Administrative Committee on Coordination during its fall 1996 session, communication and knowledge "represent the life blood of the emerging global information society and its attendant infrastructure." Thus there is a concomitant "imperative to build human and technical capacities to enable societies to facilitate access to and make best use of the new multimedia resources."

For Romania's Ministry of Foreign Affairs (MFA), whose missions are both domestic and international, such an imperative is particularly compelling. Networked digital technologies offer the prospect of closer ties to Western democracies and are instrumental in Romania's full integration in Euro-Atlantic institutions, with the potential to generate highly beneficial political and economic consequences.

With support from the US Trade and Development Agency, RAND engaged in an effort with the Romanian MFA to carry out a preliminary needs assessment and feasibility study for information and communication technology (ICT) modernization. The project set out to:

- review and analyze the MFA's evolving missions and objectives for the conduct of foreign affairs during the period ahead, with an emphasis on the near-term future;
- review and analyze the Ministry's current information and communication systems in relation to these missions and objectives;
- develop requirements for modernizing these technologies to enable them to support and enhance the Ministry's worldwide and domestic goals; and
- prepare specific information and communication technology (ICT) recommendations.

The project's overall goal was to provide a viable foundation for two subsequent efforts: 1) the development of a detailed system design and architecture plus a detailed implementation plan; and, upon approval

of this plan, 2) the timely acquisition and deployment of modernized ICTs to help support the MFA's missions in an increasingly complex, dynamic and interconnected international environment. This report describes RAND's first-phase steps toward that goal.

CONCEPTUAL FRAMEWORK AND STUDY METHODS

The project rests on a conceptual framework and research methods employed and elaborated in a range of prior RAND studies. A growing body of research, carried out both by RAND and by other institutions, has led to the general conclusion that successful implementation of new technologies in organizations is largely a function of three classes of factors, as follows.

- Organizational context: Here we include characteristics of the existing setting that are likely to affect its need for, and use of, new information and communication tools, along with characteristics of the broader institutional environment that potentially influence the adoption of more advanced ICTs.
- Technology: In this category, we include features of the current technologies available to the organization, as well as the desired features of future technologies.
- Implementation strategies: Implementation strategies include all the steps, both symbolic and behavioral, between the time an organization first decides it should make use of new computer-based media to the time when these media become incorporated into the organization's day-to-day work practices.

Further, among these classes of factors, much prior research has found that implementation processes themselves in the long run outweigh both technology features and context characteristics in explaining organizations' successes with technological innovation. For this reason, we give special attention to implementation strategy in the MFA modernization study.

Chiefly dependent on semi-structured interviews, RAND's project approach reflects the conceptual framework outlined above with respect to both its choice of participants and its information gathering orientation.

Participants

Participants providing primary data to the study were selected for interviews on the basis of their roles in the MFA and their potential relationships to future ICT modernization efforts. Within the MFA, interviews were scheduled with representatives of a range of user units with diverse missions (including those with diplomatic or trade-related functions as well as those responsible for core administration and management). These interviewees helped the project to develop an in-depth understanding of the organizational context and the kinds of tasks to be supported by the deployment of new technologies. Interviews were also scheduled with high-level Ministry officials and with representatives of other Romanian government entities to get a picture of the broader institutional environment within which the MFA operates.

To supplement their perspectives, we also interviewed representatives of technology providers in Bucharest, including Romanian companies and Romanian subsidiaries or partners of foreign companies, as well as representatives of a software industry association and an Internet service provider (ISP) association, to assess the likelihood that future calls for tender related to ICT modernization would have an adequate base of competent vendors on which to draw. Further, we held discussions with representatives of nongovernmental organizations (e.g., EU/PHARE, World Bank, UNDP, US/AID) whose programs of funding in such areas as e-government, e-commerce, e-society, democratization and the like might influence directions or priorities within the MFA's overall modernization efforts. More than 80 interviews were conducted.

Procedures

The three-member RAND project team included a senior political scientist (the project leader), a senior social scientist (responsible for most of the interviews) and a senior computer scientist (handling the project's main technical issues). Over a five-month period (mid-January to mid-June 2001) project researchers made working visits to Bucharest to gather data and to provide interim feedback on its findings to the MFA.

Interviews were typically planned to last for about an hour; however, where multiple participants were involved, two or more hours were sometimes scheduled. While giving attention to all three classes of factors expected to affect a successful transition to the new technology, the interviews focused on questions most closely related to participants' roles in relation to elements of the conceptual framework. In addition to interviews, the project gathered and made use of archival data, including organization charts, documents describing previous ICT modernization proposals and current system diagrams as well as information work samples from MFA user units and IT vendors' reports. We also observed users interacting with the MFA's current suite of computer based tools and saw several technology vendors' demonstrations.

MAJOR FINDINGS AND RECOMMENDATIONS

The major findings from the research are summarized here under the three chief components of the conceptual framework outlined above.

Organizational Context

The Ministry of Foreign Affairs is characterized by new, diverse, and complex mandates. Its actions can have profound international consequences, both diplomatically and economically.

Scanning the broader national environment suggests that growing attention is being paid to the role of ICTs throughout the Romanian government. Further, the other entities with which the MFA interacts (e.g., organizations in the international community) increasingly require and support ICT modernization in public institutions.

Chief findings concerning the MFA as an organizational context for ICT modernization include the following.

- Information and communication are core components of MFA's critical business processes.
- Information-intensive tasks are of two types:
  - many are varied in focus but supportable by highly generic software[1]; and

[1] We recommend that ICT modernization begin with support for these sorts of functions.

  - some are specific in focus and dependant on specialized applications and tools.

- Communication-intensive tasks have two kinds of partners:
  - internal participants, in Bucharest or elsewhere, need to be served by the same internal email system and intranet/Web facilities[2]; and
  - external participants, an open-ended group, should be available for interaction via Internet email and external Web sites[3].

- Communications need differing levels of security depending, for example, on whether they are informal[4], official, commercial, or secret.

The study therefore recommends, as a first priority, the creation of a digital culture that spans the Ministry and its work practices. Second, it is critical to provide an enabling infrastructure for all of the MFA's basic information and communication tasks.

Technology

"Digital divides" within the MFA today are illustrated by the following examples. Currently, computer:person ratios range from 1:1 to 0:1 across work units. Many computers lack both internal network and Internet access; and often, different units use different Internet service providers (ISPs) and have varied technical support arrangements.

Several factors contribute to the current constraints on connectivity. Presently, the MFA is distributed among several buildings in Bucharest, some of which are not fully wired. Beyond its headquarters, the Ministry's internal communication partners, which comprise 131 foreign missions, are distributed worldwide. Additionally, external communication partners (e.g., EU, NATO) may impose special technical requirements. These factors underscore the need for the MFA to keep apprised of changing global ICT environments.

Major findings concerning enhancements of the MFA's current ICT status and its modernization include the following.

---

[2] Ibid.
[3] Ibid.
[4] Ibid.

- The MFA needs a Metropolitan Area Network (MAN) linking all its Bucharest buildings, offices and people. This effort should include as goals:
  - providing a computer for every user plus a standard software suite;
  - establishing standard individual email addresses plus Internet and MAN/intranet access for all (supporting the growth of a digital culture within the Ministry while enabling routine electronic exchange with external entities that are Internet-accessible); and
  - acquiring tools to support development access of high priority specialized applications on an incremental, modular basis.

- The MFA should do a Wide Area Network (WAN) pilot project linking headquarters with foreign missions. It should:
  - start with a small subset of key foreign offices (e.g., Brussels, Washington) where international connectivity would be available;
  - introduce a virtual private network (VPN) that gives transparent access to internal ICT facilities and offers voice-over-IP (yielding potentially significant telecommunications cost savings while affording secure avenues for official information exchange with communication partners outside the reach of the headquarters MAN);
  - conduct special training with Bucharest-based and foreign office users; and
  - evaluate costs, benefits, other lessons learned for broadening the system's global reach.

- The MFA's networked ICTs should be both scalable and extensible, susceptible to evolution:
  - at any point in time, the network must be heterogeneous;
  - generic technologies will have to be compatible with future Romanian government plans for e-signatures, e-commerce, and other e-government applications; and
  - the infrastructure must permit introduction of new technologies as they emerge on the market.

- There are enough companies, both domestic and foreign, that are competent to provide the required technical systems, services and support in Bucharest.

The study advises that the MFA prepare a Request for Information (RFI) and/or a Request for Proposals (RFP) to solicit responses from interested ICT provider firms. It is also recommended that the Ministry continue to make visible progress toward ICT modernization by such means as extending current LAN access and completing the new Web site.

Implementation

The MFA has made a go-ahead decision for ICT modernization, and the initial pieces of an implementation strategy are in place. An ICT project task force has been created, and there exists high level interest and support among Ministry representatives and government officials. Technical progress is currently underway on key ICT objectives.

Chief findings concerning project implementation include the following.

- Future ICT implementation can be seen as having two main components:
  - (1) providing a basic infrastructure for digital work practices; and
  - (2) completing projects to improve specific critical business processes.
- Government funds or loan guarantees should be sought for the ICT foundation (part 1).
- Well-designed projects can attract targeted program funds from multilateral or bilateral donors (part 2), such as
  - UNDP
  - WORLD BANK
  - [others]
  - US/AID
  - EU
  - :
- The MFA's Informatics unit needs immediate capacity building, including:
  - more senior informatics professionals;
  - consolidation of technical support across the MFA;
  - higher status in the organizational structure; and
  - a single designated contact for gathering and exchanging ICT-related information.
- Technical human resource needs must be filled before implementation can move forward.
- The MFA should prepare a plan and schedule for action that:
  - specifies what will be in the initial ICT foundation (part 1) and anticipates priorities for special projects (part 2);
  - reflects these decisions in an RFI/RFP; and
  - treats this study as a foundation and outline for that plan.
- Users must be involved in implementation processes to:
  - test and evaluate generic tools;

  - help prioritize and design projects that involve specialized tools for specific business processes; and
  - develop policies and procedures to guide new digital work practices.

- Coordination with other ministries' ICT efforts will be a critical success factor.

The study therefore suggests that the MFA immediately acquire the needed human and financial resources to take the next implementation steps. Based on the above findings, we judge that beginning work on a strategic action plan for successful ICT modernization is a critical first step for the Ministry.

CONCLUSIONS

The common wisdom is that few problems can be solved by throwing money at them. The problem this report addresses is an exception to that general rule. Simply put, the MFA lacks sufficient hardware and connectivity on which to base improvements to its information and communication systems. This lack can be remedied with technologies presently available on the market, so long as financing can be arranged. Without access to contemporary technologies, it is hard to envision any significant performance improvements in the MFA's information- and communication-intensive missions. However, a well-designed ICT infrastructure will serve as the base on which powerful business solutions can successively be built as implementation progresses.

If funding were available, human resource limitations would not constitute a major implementation obstacle. Professional MFA employees do not show reluctance to use new computer-based media. Rather, across varied divisions employees stressed the need for more and better on-line tools. Moreover, the senior professionals in the Informatics Division are well trained and have a strong command of English as well as strong technical skills. Given the funds, it should be possible to increase the size of the technical staff to the level that would be required to maintain a larger and more advanced information and communication system.

Further, during the course of our study, we visited a number of key software, network, and system integration companies within Bucharest, both domestic and foreign. We were impressed by these companies' professionalism, knowledge, and ties to major suppliers of hardware, software and telecommunications (e.g., Microsoft, Compaq, Cisco, Omnilogic BGS, Global One, KPNQwest, and various ISPs). It is clear to us that there is abundant talent within the private sector in Romania to supply all the capabilities (hardware, software, systems integration, documentation, and education and training) required by our recommendations.

We should underscore that the first-phase RAND effort reported here has raised hopes—it seems to be attracting a notable amount of professional commitment and energy. People in the Ministry think of advanced ICT as helping their effort to build links to Western governments and economies. However, a 1998 modernization effort ended in a well-done report with no follow-up action; it is thus extremely important that the current project lead rapidly to concrete, positive action and achievement, both to show results and to demonstrate to all involved that their efforts can and will pay off. So even before all the pieces of a solution to the ICT modernization problem can be worked out, this first-phase project should lead to some viable action items—steps that can be taken by the Ministry in the near term that would make a positive difference. The asterisked major findings under **Organizational Context** above, and the initial actions listed under **Technology** above -- combined with the plan and schedule for action called for under **Implementation** -- can form the basis for those near-term actions.

Finally, as a geographically distributed organization with world-wide missions and as a leading agency for Romania's integration in Euro-Atlantic institutions, the Ministry of Foreign Affairs can best meet its goals and objectives by employing fully the tools of 21st century diplomacy. Indeed, this is indispensable. Moreover, current developments in the Romanian government (e.g., a new Ministry for Communication and Information Technology, a parliamentary committee on e-legislation, a president who has made information society advancement

one of his top three priorities), together with ICT-related programs and initiatives supported by major nongovernmental organizations with representation in Romania, are strikingly convergent indicators that this is the right time for the MFA to move forward aggressively on its modernization agenda. The foregoing recommendations are intended to serve that end.

ACKNOWLEDGMENTS

We are indebted to many people for their cooperation and assistance with this study. At the outset we want to acknowledge the encouragement and support of Romanian Foreign Affairs Minister Mircea Geoana, without whose insights and enthusiasm for advanced digital tools this project would not have been realized.

We are especially grateful to the Ministry's former Director for Strategic Planning and Analysis, Raduta Matache, for her continuing guidance, thoughtful suggestions and constructive feedback throughout the course of the study. Her leadership was vital to the project's success. Very special thanks go as well to Savina Teodorescu and Paul Voicu, senior professionals in the Ministry's Informatics Division, for their invaluable help; they coordinated many aspects of our working visits, provided us with background documents, spent many hours briefing us on the Ministry's current uses of computerized technologies, advised us on future needs and plans, and contributed in innumerable other ways to the substance of our work.

We wish also to thank the many other divisions and departments of the Ministry that took part in the study. Their representatives made time available to talk with the project team, candidly sharing their knowledge and experience. We learned a great deal from them.

In addition, the project benefited significantly from working visits to other ministries and government entities, to multilateral organizations, and to private sector firms and associations located in Bucharest. These discussions helped us develop a clearer picture of the broader context within which the Ministry of Foreign Affairs carries out its information- and communication-based missions.

Last, we should acknowledge the contribution of our RAND colleague, Maarten Botterman. His review and critique of an earlier draft helped us considerably in preparing the final version of this report.

CONTENTS

ABBREVIATIONS

CIO	Chief Information Officer
EU/PHARE	The European Union's Poland Hungary Aid for the Reconstruction of the Economy
FTC	Foreign Trade Center
ICT	Information and communication technology
ISP	Internet service provider
IT	Information technology
LAN	Local area network
MAN	Metropolitan area network
MCIT	Ministry of Communications and Information Technology
MFA	Ministry of Foreign Affairs
OSCE	Organization for Security and Cooperation in Europe
PBX	Private branch exchange
PC	Personal computer
PFP	Partnership for Peace (NATO partners)
PGP	Pretty Good Privacy (commercially available encryption system)
PKI	Public key infrastructure
RDBMS	Relational database management systems
RFI	Request for information
RFP	Request for proposals
UN/ECE	United Nations' Economic Commission for Europe
UNDP	United Nations Development Programme
US/AID	U.S. Agency for International Development
VoIP	Voice-over-Internet protocol
VPN	Virtual private network
WAN	Wide area network

1. INTRODUCTION

Information gathering, analysis, interpretation, decisionmaking and dissemination--as well as the documentation of these actions--must be treated as critical business processes by government entities in the 21st century. According to a statement released by the United Nations Administrative Committee on Coordination during its fall 1996 session, communication and knowledge "represent the life blood of the emerging global information society and its attendant infrastructure." Thus there is a concommitant "imperative to build human and technical capacities to enable societies to facilitate access to and make best use of the new multimedia resources."

For Romania's Ministry of Foreign Affairs (MFA), whose missions are both domestic and international, such an imperative is particularly compelling. Networked digital technologies offer the prospect of closer ties to Western democracies, with the potential to generate highly beneficial political and economic consequences.

With support from the US Trade and Development Agency, RAND engaged in an effort with the Romanian MFA to carry out a preliminary needs assessment and feasibility study for information and communication technology (ICT) modernization. The project set out to:

- review and analyze the MFA's evolving missions and objectives for the conduct of foreign affairs during the period ahead, with an emphasis on the near-term future;
- review and analyze the Ministry's current information and communication systems in relation to these missions and objectives;
- develop requirements for modernizing these technologies to enable them to support and enhance the Ministry's worldwide and domestic goals; and
- prepare specific information and communication technology (ICT) recommendations.

The project's overall goal was to provide a viable foundation for two subsequent efforts: 1) the development of a detailed system design and architecture plus a detailed implementation plan; and, upon approval of outputs from the planning phase, 2) the timely acquisition and deployment of modernized ICTs to help support the MFA's missions in an

increasingly complex, dynamic and interconnected international environment.

This report describes RAND's first-phase steps toward that goal. Section 2 provides a brief account of the conceptual framework and research methods; Sections 3, 4 and 5 discuss, respectively, the organizational context characteristics, technology considerations and implementation issues that should be taken into account in any future modernization efforts. Section 6 presents our conclusions and recommendations for next steps.

It is our hope that this study will be of benefit to the Romanian Ministry of Foreign Affairs as it seeks to develop its information technology and communication systems to meet the demands of 21st-century diplomacy. We have been pleased to assist the Ministry in this effort.

2. CONCEPTUAL FRAMEWORK AND STUDY METHODS

The project rests on a conceptual framework and research methods employed and elaborated in a range of prior RAND studies (see the Bibliography). A growing body of research, carried out both by RAND and other institutions, converges on the conclusion that successful implementation of new technologies in organizations is largely a function of three classes of factors, as follows.

- Organizational context: Here we include characteristics of the existing setting that are likely to affect its need for and use of new information and communication tools (e.g., its mission-based information tasks, how it is organized to accomplish them, key communication partners, both internal and external, for these purposes, and the like). We also include characteristics of the broader institutional environment that are potential influences on the adoption of more advanced ICTs.
- Technology: In this category we include features of the current technologies available to the organization as well as the desired features of future technologies. Additionally we take into account the organization's special technical requirements and constraints as well as the kinds of options available on the market that are likely to satisfy them.
- Implementation strategies: Implementation strategies include all the steps, both symbolic and behavioral, between the time an organization first decides it should make use of new computer-based media to the time when these media become incorporated into the organization's day-to-day work practices. Such steps include, for instance, financing, planning and policymaking; they also take in project development and management as well as technology acquisition and installation; and they involve training, work redesign and help support.

Further, among these classes of factors, much prior research has found that implementation processes themselves in the long run outweigh both technology features and context characteristics in explaining organizations' successes with technological innovation. For this reason, we give special attention to implementation strategy in the MFA modernization study.

Chiefly dependent on semi-structured interviews, RAND's project approach reflects the conceptual framework outlined above with respect both to its choice of participants and its information gathering orientation.

PARTICIPANTS

Participants were selected for interviews on the basis of their roles in the MFA and their potential relationships to future ICT modernization efforts. Within the MFA, interviews were scheduled with representatives of a range of user units with diverse missions (including those with diplomatic or trade-related functions as well as those responsible for core administration and management). These interviewees were expected to help the project to develop an in-depth understanding of the organizational context and the kinds of tasks to be supported by the deployment of new technologies. Interviews were also scheduled with high-level Ministry officials and with representatives of other Romanian government entities to get a picture of the broader institutional environment within which the MFA operates.

Two kinds of role incumbents were selected for interviews intended to provide detailed information about the Ministry's current technical resources, the nature of modernization options available now or likely to become available in the near term market, and any special requirements or constraints that future ICT implementation strategies would confront. Senior members of the MFA's Informatics Division were interviewed extensively for these purposes. We also interviewed representatives of technology providers in Bucharest, including Romanian companies and Romanian subsidiaries or partners of foreign companies, as well as representatives of a software industry association and an Internet service provider (ISP) association, to assess the likelihood that future calls for tender related to ICT modernization would have an adequate base of competent offerors on which to draw.

Participants in the two groups just described were also able to comment on new technology implementation boosters and barriers that ICT modernization efforts would be expected to confront. To supplement their perspectives and to get additional needed insights into viable implementation strategies for the MFA, we also conducted several interviews with the MFA Director responsible for the RAND project and met twice with the task force tapped to advise its modernization efforts. Further, we held discussions with representatives of nongovernmental organizations (e.g., EU/PHARE, World Bank, UNDP, US/AID)

whose programs of funding in such areas as e-government, e-commerce, e-society, democratization and the like might influence directions or priorities within the MFA's overall modernization efforts.

The table below presents the distribution of over 80 interviews among the categories just described.

Distribution of Interviews

LOCATION	NUMBER
Ministry of Foreign Affairs	
• Study project officer	6
• Other high level officials	8
• Informatics Division	10
• Diplomatic Divisions	10
• Commerce Divisions	6
• Core Divisions	5
• Foreign Trade Center	7
• Foreign Missions	3
Outside the Ministry	
• Technology firms and associations	12
• Other government entities	7
• Nongovernmental organizations	8
Total:	82

PROCEDURES

The three-member RAND project team included a senior political scientist (the project leader), a senior social scientist (responsible for most of the interviews) and a senior computer scientist (handling the project's main technical issues). Over a four-month period (mid-January to mid-May 2001), project researchers made working visits to Bucharest to gather data and to provide interim feedback on its findings to the MFA.

The table above represents the number of interviews carried out. This total differs from the number of participants for two reasons. First, some key participants were interviewed on repeated visits (e.g., members of the Informatics Division as well as the MFA project officer).

Second, many interviews were conducted with multiple respondents (e.g., interviews with IT firms and industry associations, as well as interviews with government entities outside of the MFA).

Interviews were typically planned to last for about an hour; however, where multiple participants were involved, two or more hours were sometimes scheduled. Interviews began with a discussion of the participants' key responsibilities and how those responsibilities might influence or be influenced by anticipated ICT modernization efforts. Subsequently, while giving attention to all three classes of factors expected to affect a successful transition to the new technology, the interview focused on questions most closely related to participants' roles as distinguished by the conceptual framework set out above.

Finally, it is worth noting that, in addition to interviews, the project gathered and made use of archival data, including organization charts, documents describing previous ICT modernization proposals and current system diagrams as well as information work samples from MFA user units and IT vendors' reports. We also observed users interacting with the MFA's current suite of computer based tools and saw several technology vendors' demos. Subsequent sections of this report rely on the analysis and interpretation of information gained from these sources.

3. ORGANIZATIONAL CONTEXT

As explained in the previous section, the characteristics of an organization as well as those of the broader institutional environment of which it is a part can be expected to influence the organization's interest in adopting new technologies as well as the specific technologies it adopts and the course of their implementation. Here we first describe the immediate organizational context for ICT modernization and then briefly summarize potentially relevant aspects of the larger setting.

THE MINISTRY OF FOREIGN AFFAIRS

A new Romanian government was elected in December 2000. When this project began its work in January 2001, a new Foreign Affairs Minister had just taken office. At the same time, the Ministry itself had just undergone a number of internal changes (e.g., divisions formerly part of a ministry of Industry and Resources had become part of the MFA).

The new government set for itself a number of ambitious goals for Romania's engagement in the outside world, and especially to achieve its desire of becoming a full member of all important Euro-Atlantic institutions. Its efforts have been marked by Romania's participation in NATO's Partnership for Peace (PFP), as PFP's first member in 1994; by participation in NATO's Euro-Atlantic Partnership Council and in the NATO-led peacekeeping forces in Bosnia and Kosovo; and by application for full membership in the Alliance. Romania is also a member of the Council of Europe. Further, it is a candidate for membership in the European Union, is included on the "Copenhagen list" of countries slated to join the EU, and is currently negotiating with Brussels on its admission. Notably as well, during 2001, Romania (though its Foreign Minister, Mircea Geoana) has been serving as Chairman-in-Office of the Organization for Security and Cooperation in Europe (OSCE), a challenging task with major demands on the Ministry of Foreign Affairs' ability to communicate rapidly and effectively with all of the other member states.

In addition to these diplomatic missions, the Romanian Ministry of Foreign Affairs understands that it needs to provide modern communication linkages to the private sector, both in Romania and abroad, integrating the work of the newly acquired Department for Foreign Trade and Economic Promotion in accomplishing these aims. The Ministry is thus committed to playing a leading role in a 21st century framework of action, on a par with ministries in other countries, as befits Romania's progress toward full participation in international life, taking its rightful place in the community of nations.

In a public briefing in June 2001, Minister Geoana characterized his vision for a "new and modern Ministry for Foreign Affairs" as seeking to achieve the following objectives:

- Enhanced and continuous training for diplomats and staff;
- A modern approach to management, including human resources management;
- Better coordination with other public administration agencies;
- Flexible working practices—task-forces with the private sector as well as with representatives of academia and non-governmental institutions;
- Closer cooperation with other Ministries of Foreign Affairs, especially in Western European and North American countries; and
- Modern communications and large scale introduction of information and communication technology (ICT).

Minister Geoana concluded that new networked technologies are "crucial to the new diplomacy of the 21st century." He argued that "Romanian diplomacy, rooted in a solid tradition, has to adapt, in order to preserve or regain its prestige and to be able to fulfill Romania's foreign policy objectives." Noting that other ministries in Western countries have already taken steps to introduce modern technology, he said, "The good news is that Romania is attempting to have an 'IT fully-equipped' diplomacy almost at the same time as most of the Western countries."

The Ministry's 21st century diplomatic and economic objectives would be well served, then, by ICT modernization. Further, most members of

the Foreign Affairs Ministry interviewed for this study believe that the profound importance of these missions can only boost the prospects for ICT modernization. They are encouraged by the fact that the new Minister, formerly serving as Ambassador to the United States and posted in Washington DC, came to his position highly fluent in the day-to-day use of new networked media. And uniting commerce-oriented units with foreign affairs, they think, will intensify the case for rapid adoption of new ICTs to promote ready and reliable exchanges with important communication partners within and outside the Ministry.

Ministry Structure

The Ministry is a complex and changing organization with many levels and multiple orientations; its Bucharest-based business units are located in several different buildings. For purposes of this project, its divisions can be grouped into three categories.

- There are divisions whose missions are inward facing, so to speak, and have to do with how the Ministry functions. They vary in hierarchical level and include, for example, the Strategic Analysis Division (with oversight responsibility for this project), the Informatics Division, the Financial Division, and the Human Resources Division.
- There are outward facing divisions whose missions involve the functions traditionally associated with international diplomacy. These include divisions focused on bilateral affairs (e.g., the North American Division) and on multilateral affairs (e.g., the NATO Division, the EU Division, the OSCE Division).
- There are also outward facing divisions whose missions involve activities traditionally associated with commerce. These include, for instance, the Division for Promotion and Stimulation of Exports, the Division for Foreign Trade and Tariffs Settlements, the Division for European Economic Cooperation, and so on.

As noted, The present organizational structure reflects some very recent changes. Until last year, the commerce-oriented divisions were part of another ministry; they have only just been incorporated into the MFA. On the other hand, an entirely new Ministry for European Integration has been created; it assumes some of the functions formerly carried out in the MFA's EU Division. Both sorts of changes represent important new MFA stances. Bringing commerce-oriented divisions into the Ministry, for instance, signals the critical role of economic reform

and revitalization in Romania's future. Establishing a separate ministry primarily to handle aspects of negotiations of Romania's entry into the EU, on the other hand, indicates the significance and salience of that effort in Romania's main objective to be more closely linked to the West, both economically and politically.

The Ministry's formal organizational structure may well undergo further change, given that it is part of a new government and is facing a dynamic external environment. Nonetheless, the current organizational structure is a good starting point for this project for two reasons. First, regardless of how divisions are formally arranged and rearranged for management and administration purposes, the basic missions carried out by the Ministry and the general kinds of information and communication these missions require are not likely to undergo rapid change. Second, any new information and communication system for the Ministry must be designed with future evolution in mind. Its design should not be tied to any specific organizational structure; rather, it should be based on the assumption that the organizational structure will inevitably change, that significant new relationships among divisions and between them and other institutions will develop, and that any future ICT should readily accommodate emerging patterns of intramural and extramural communication and information sharing. Consequently, the ICT modernization project should be grounded in the divisions' main information-intensive tasks and the types of communications and communication partners they have at present, but it should not try directly to mirror current information flows in system design.

Ministry Information-Based Tasks

Needless to say, it is not a good idea to think about information separately from communication. At the MFA, as in most complex hierarchical organizations, many tasks start by getting information (on different topics, from varied sources, using multiple media). And, after analysis, exploration, deliberation, interpretation, decisionmaking, and so on, many tasks end by communicating the results. So information-handling applications and tools need to be embedded in a broader system that also supports information sharing and communication,

via email as well as intranet and Internet Web access. That being said, it is nonetheless helpful for design and planning purposes to separate the two.

Information intensive tasks can be sorted provisionally into two types on the basis of the technology support they could use (the interviews generated many examples of both).

- Many information-intensive tasks performed in the Ministry, regardless of the missions in which they are embedded, could make good use of highly generic information technology support. The applications included in a standard office software system (e.g., text preparation, spreadsheets, graphics, file management) would be likely to fill many of these needs. A document management system, shareable files and other tools to facilitate collaborative work would also be desirable.
- Other information work is much more task- or role-specific and would require more specialized technology support (e.g., financial systems and personnel systems were mentioned, along with systems for automatically querying external databases relevant to import and export laws and regulations, and for updating internal information stores accordingly).

Future ICT modernization efforts should focus first on provision of generic applications and tools, and should subsequently help divisions with highly specific support needs to build the specialized applications they require. Ideally the latter types of applications should use tools and techniques that will assure their integration within the larger environment; and at least some of the datasets now resident in mainframes may be susceptible to migration into new interactive relational database software. In the interim, those divisions will probably have to continue their current practices (e.g., keying data as needed into legacy batch-processing systems), unless other techniques (e.g., using "wrappers," or software that translates between two differing formats) can be devised to work around those barriers.

Ministry Communications

Communications should probably be sorted along two different axes, related to kinds of communication partners and to levels of security needed. With respect to communication partners, one key distinction is between external and internal (or, closed sets of) participants to interactions.

- Although the dividing line is not sharp, "internal" participants can be regarded as those who would become part of the Ministry's internal email system and intranet (if these facilities existed). All divisions of the Ministry and their employees should be regarded as internal communication partners, regardless of where they are physically housed. Whether missions and consulates (about 131) should be regarded as internal or external communication partners is perhaps a policy question (but it seems to us that they should be viewed as internal to the Ministry from a communications perspective). If they are regarded as internal communication partners, from the standpoint of the ICT interface, interacting with them shouldn't differ--as far as end users are concerned--from interacting with other communication partners internal to the Ministry and located in Bucharest.

- External communication partners constitute a much more diverse and open-ended group. They include, for example, other ministries with whom there are long-standing communication flows (e.g., the Defense Ministry) as well as newly established ministries (e.g., the Ministry of Communication and Information Technology), with whom patterns of communication will surely emerge. Further, diplomatically-oriented divisions and embassy/consulate personnel need to communicate with their counterparts in other government embassies and with representatives of multilateral organizations. Commerce-oriented divisions, on the other hand, need to interact with yet another set of external partners, including corporations, business and professional associations, and government agencies involved in customs, tariffs and the like. Additionally, the Ministry needs to be able to present itself to the press and the general public and, eventually, to support online services to citizens as a part of e-government initiatives.

A second major dimension on which MFA communication activities vary has to do with security. Provisionally, it seems to make sense to think of three levels (or perhaps more) of security.

- In some cases, communications need to be extremely secure; the media to be used will require approval from the Division for Special Communications. Further, sometimes the nature of security requirements is determined by, or in consultation with, the communication partner(s). Certain types of diplomatic interactions with the EU or with NATO, for instance, must be handled by STU3 media. Future e-commerce-like activities (e.g., electronic import/export licensing) will require other sorts of quite specific security guarantees.

- For other sensitive communications, the use of the "secret" designation now means they must be encrypted and sent by telex. Some interviewees believe that the "secret" classification is being overused by people who think it will cause material with that designation to be accorded higher priority. In any case, the Ministry needs to have some means for protecting sensitive communications that do not fall under the first category but that currently are treated as restricted, confidential or secret.

- Communications that are "official" but not secret are presently sent generally as "infograms." These are

> transmitted by email to the Informatics Division, where a formal file copy and distribution copies are printed. The file copy (copy #1) goes to the registry and the others are circulated as internal correspondence. For these communications, assuring their integrity as well as their registration and storage for future retrieval is paramount.

When interviewees talk about communication partners, they often seem to give greatest attention to external communications in general and to Web-based dissemination in particular; on the internal side, they tend to emphasize communications with foreign missions. These lines of communication, of course, have salient roles to play in accomplishing Ministry objectives. For these very reasons, however, it is probably easy to underestimate the crucial part played by internal communications. Important data and documents do not leave the Ministry without revision and clearance, and may iterate through a number of internal desks and hierarchical levels before they leave the Ministry and arrive at an external destination. So timely and reliable production of external communications should be viewed as highly dependent on effective internal communications. Interviewees in other organizations analogized these to "front office" vs. "back office" interactions; while the former have public visibility, they depend heavily on the latter for accomplishing the business processes with which they are associated.

Moreover, MFA interviewees for the most part also underestimate the importance of informal social interchange (or "weak ties," as they are called in communication research). Such interchange helps spread knowledge throughout an organization and will be particularly important to the development of a digital communication culture and network interaction norms within the Ministry. The development of both collegial and formal email-based ties between commerce- and diplomacy-oriented MFA divisions that deal with the same regions, nations, and external communication partners should be especially encouraged. Although technically the two types of Divisions now belong to the same Ministry, they don't know one another and don't have a shared institutional culture. Being located in different buildings a few kilometers apart, these divisions would likely benefit in a great many

ways by joint access to a common information and communication environment.

It seems, then, that the highest priority for communication should be given to providing full connectivity for all internal communication partners. Besides helping to create one Ministry out of what are now disparate components, it would contribute greatly to the development of a digital culture. It should also be regarded as a necessary (but not sufficient) condition for establishing effective practices, norms and policies regarding external digital communications. Simply put, effective external digital interactions demand timely and credible official response capabilities on the part of the Ministry. For reasons explained earlier, such capabilities depend heavily on rapid and reliable internal communication and information handling processes.

Both internal and external communications demand some attention to security levels. In the interest of timeliness and start-up cost minimization, it seems appropriate first to focus ICT implementation on the lowest level of security requirements. These requirements are likely to satisfy a substantial proportion of internal communication needs. At the same time, some intermediate-level secure communication needs might be met using readily available protections and procedures (e.g., commercially available systems such as Pretty Good Privacy (PGP) encryption). Highly specialized communication systems that must meet more stringent requirements to protect international security or e-commerce interests could continue to be satisfied through the interaction mechanisms now in use until more advanced network solutions can be implemented to replace them.

THE BROADER ENVIRONMENT

It would go well beyond the scope of this project to review in depth the broader institutional/political environment of which the MFA is a part. Rather, the discussion below is intended mainly to call attention to a small number of salient points about that environment.

To begin, the new Romanian government has sent several strong signals about its intent to advance the nation's progress into the digital age. First, the creation of a government entity at the Ministry

level concerned exclusively with communication and information technology goals for Romania, and headed by an experienced telecommunications manager, is one of these.[5] The Ministry of Communications and Information Technology (MCIT), because of its recency, is not among the regular external communication partners of the MFA treated above. Nonetheless, it is critical for the MFA to stay in close touch with the new Ministry's mission, strategic plans, policies and actions. Although the specific ways the new Ministry will carry out its mandates cannot yet be anticipated, it is very likely that it will be closely tracking European Union initiatives related to the information society in Europe. It has also created a government task force (with 5-6 ministries represented) that is charged with high level strategic planning toward two major foci: the information society (largely concerned with citizens' access to the Internet); and e-government. The latter focus has a direct relationship to the MFA's activities. Any ICT modernization efforts undertaken by the MFA should closely monitor and be informed by activities undertaken in support of e-government; ideally it should try to become a member of the MCIT's high level task force.

Another signal from the new government about the significance of ICT advance is the creation of a parliamentary committee concerned with formulating and enacting legislation that will make a stable regulatory environment for e-commerce, e-government and e-society. The committee has sent EU-compliant draft laws to the parliament, including an e-signature law. When they are approved (expected by the end of 2001), Romania will become one of the first 10 European states to have established all the EU-required legislation for e-commerce. A third message, beamed directly to the public as well as to government agencies, concerns the importance of email connectivity. In a publicly televised and widely viewed event, the Prime Minister and the rest of

---

[5] The Minister for Communications and Information Technology, Mr. Dan Nica, has been named to a United Nations task force charged with elaborating a global action plan for the use of new information and communication technologies to promote development and reduce digital divides in developing countries as well as countries with transition economies.

the Ministers in the new government were given lessons in how to use email; seated at networked computers around a long table in the house of parliament, each sent and received email messages.

Besides the broader environment within Romania, it is important also to call attention to institutions outside Romania that are potentially important stakeholders in the MFA's future ICT modernization efforts. One is the European Union, and in particular its eEurope Action Plan of June 2000. The Action Plan concerns not only technology standards and related legislation, but also information and communication policies and norms that affect a wide range of societal interests (e.g., transparency, privacy) and domains (e.g., government, education, employment, commerce). The MFA should assure that its ICT modernization efforts are cognizant of and compliant with European Union initiatives. It might also attempt to determine whether its modernization efforts could become part of and benefit from any eEurope projects (especially those associated with candidate states). Similar comments hold for the Stability Pact for Southern and Eastern Europe; the MFA, as a participant in the Pact, should draw support from the plan where possible.

As a last point, it is critical to identify options and means for US technology providers to become involved in the next phases of the ICT modernization project. While this point may perhaps be so obvious as not to need stating, it surfaces an issue that should be confronted here. US and European ICT-related standards and regulations are not necessarily congruent, and sometimes are in conflict. It is important for the MFA to refrain from making either-or choices in this arena. Instead, it should favor generic systems that can realize alternative system approaches or, if that strategy is not feasible, should avoid limiting its options as long as possible (e.g., until late-stage implementation). If US and European standards and regulations are not closer together by that time, some mixed strategy could be pursued to promote harmonization with stakeholders on both sides of the Atlantic.

4. TECHNOLOGY

Information and communication technologies are not distributed evenly over the MFA's varied divisions. This section of the report first presents an overview of the technology landscape at present. It then discusses some major issues that the ICT modernization project may need to take into account, calling attention to a number of questions these issues raise.

This account, however, should be treated as a snapshot of a moving series of events. The Informatics Division, with encouragement from higher level Ministry officials, has been eager to advance the organization's ICT base. Both independently as well as in response to interim feedback from the project team after each working visit, the Ministry has made and will continue to make improvements in computerization and connectivity.

TECHNOLOGY OVERVIEW

To say there is a digital divide within the Ministry is perhaps to oversimplify the picture. It is probably more appropriate to say that the MFA currently comprises several fairly different ICT environments. They are characterized here in order of decreasing access to digital resources.

Foreign Trade Center

From the perspective of the organization chart, the Foreign Trade Center (FTC) is partly within and partly outside the Ministry. To the extent that it is a part of the Ministry, it is aligned with the commerce-oriented divisions reporting to the State Secretary for Foreign Trade and International Economic Cooperation. However, it has a special status since it also exists independently of the Ministry; at least half of its funding is from sources outside the MFA.

With about 110 employees and 110 computers, the FTC is more technology rich, by far, than any other part of the MFA. Among its PCs, 30 are in the pentium 2-3 range, while the others are somewhat older

pentiums. All have 24-hour access to the FTC intranet as well as to the Internet, where the FTC maintains two external Web sites. (The FTC also produces CD/ROMs for external communication partners who cannot readily access its Web sites.) Employees all use email regularly for both internal and external communication, including official communication (e.g., with UN/ECE).

A 9- to 10-person technical team develops and maintains this ICT environment. Several NT servers are in use, along with a Linux machine to handle routing. Additionally there are development machines for writing new programs, exercising problems, testing solutions, and so on. An ISP ("ktv") handles Internet services for the FTC.

High in FTC users' priorities for the future are better grade computers and anti-virus software, along with better graphics programs and multimedia capabilities. The FTC is also working toward business-to-business signature capability to further its role in e-commerce, and it would like to develop facilities for videoconferencing and live video transmission to actual and potential business partners.

The Foreign Trade And International Economic Cooperation Department

The 12 regular commerce-oriented divisions in the Department comprise about 90 employees. There are about 50 computers (2-3 per division), and at least one computer in each division has an intranet connection. About a third of all employees have email accounts and Internet access.

Electronic information is distributed to division colleagues largely through the use of shared folders. For example, the rule is that trip reports or reports of participation in important events must be put into the system within 5 days. The system also has a "who's who in this Department" as well as a calendar of upcoming economic events of interest to the divisions. Employees not connected to the internal network typically prepare information for sharing at the PC they use, and afterward store it on a diskette; when a machine with network access becomes available, the employee can then upload the material from the diskette to the appropriate shared folder. In this way, all employees use the internal network, even though it requires turn-taking.

Professional support for ICT in the commerce-oriented divisions had been provided, until spring 2001, by the Institute for Management and Informatics; housed within the same building, it also acted as their ISP ("imi"). This technical support arrangement is coming to an end, however, because the Institute and its equipment (e.g., servers, firewalls) are formally affiliated with the Ministry of Industry and Resources (the former home of the commerce-oriented units). The MFA's Informatics unit will soon have to assume responsibility for supporting the newly added divisions. In the meantime, those units are also receiving some technical assistance from the FTC.

Commerce-oriented divisions see more equipment and an external Web site, plus Internet access and email for all employees, as their most pressing current needs. In the near future the Department would also like to have the capability for electronic licensing of businesses (last year 6,500 business licenses were issued manually). Interestingly, the Department has already developed the design for an external Web site, and internal procedures have been established for producing daily updates to the system. It is estimated that most divisions have done 60 to 70 percent of the work required to put their external material on the Web, and an operational demo is available. But lack of equipment, technical staff and funds to complete the implementation and to support and maintain the system means the Department can't take the final steps required to reach the goal of going public with its digital commerce-oriented information and interactions.

The Diplomatic and Core Departments

Before being joined by the commerce-oriented divisions, these units constituted the bulk of the MFA. Carrying out critical missions related to all aspects of international policy except those tied to defense and to global economics, they represent a population of about 600 employees (or, three quarters of all Ministry employees) and have a total of about 250 computers. About half of these computers have access to a local network and, via that, to the Internet; where available, these connections permit informal email communications with many of the MFA's missions abroad. The proportion of computers with network access is so

low essentially because of insufficient physical connectivity between offices and central servers (there are only 2 outlets for offices that may house 4 or more employees each). In addition, some divisions (e.g., Cultural Relations) are located in buildings near by but physically separate from the main quarters; these divisions have no means of connecting with the Ministry network.

Three centralized servers accessible over a fiber optic LAN constitute the backbone of the ICT for the networked divisions. The email server uses routers and modems to access the ISP ("kappa") that handles their Internet activity. There is an external Web site for the Ministry, but there is no intranet and no internal Web site; most of the information on the external site is solicited and prepared by the webmaster. Further, there are some legacy applications serving core divisions (finance, personnel) that are not integrated with anything else in the ICT environment.

Technical support is provided by the Informatics Division, which has a staff of 3 computer professionals and 8 others. The Informatics Division head doubles as the system administrator, while another senior professional serves as the software specialist and also as the webmaster.

Informatics Division representatives were heavily involved in preparing a 1998 ICT modernization plan and have been valuable resources for the present effort. However, any steps taken to expand the ICT infrastructure and engender a digital culture across the Ministry's diverse divisions would undoubtedly require increasing the number of technical professionals in the Informatics Division (the professional staff is already overloaded).

High near-term priorities for the diplomatic and core internal divisions of the MFA include computers with access to internal email and the Internet for all employees, as well as an intranet and an improved external Web site plus capabilities for secure communications with colleagues in foreign missions. Additionally employees would like a standard suite of generic applications, along with integrated access to specialized tools (e.g., financial data, personnel data). Future needs also include collaborative work applications, laptops with docking

stations for diplomats to take on missions so that they can remain in touch with headquarters, and videoconferencing capabilities.

Communication Partners

The limited scope of the present project did not provide an opportunity to assess the general state of ICT among major communication partners of the MFA. As explained earlier, the diplomatic divisions have considerable interest in timely and secure digital communications with the MFA's foreign missions. Among the 126 embassies and general consulates, 113 have Internet access. It is, however, unclear what proportion of employees in those missions have email accounts and what kinds of technical resources might be available to assist their transition to reliable digital interaction with the headquarters. Presumably capabilities vary considerably, depending in part on the state of infrastructure development in the host country. Nonetheless, we expect that foreign missions that account for high volumes of communication (e.g., those located in Brussels, Washington DC, Paris) are likely to be in places with well functioning telecommunications infrastructures.

Commerce-oriented units aim at establishing online communications and transactions with Romanian firms. At present, there are 865,000 "legal entities" in Romania. Among them, over 500,000 companies use the Internet; it is estimated that about 90 percent of companies engaged in foreign trade have Internet access. However, the distribution of access over employees within firms is unknown. On the other hand, for purposes of accessing import/export information and applying for licenses, most firms would not need a large number of computer users with Internet connectivity.

Internet access for purposes of inter-ministerial communication will emerge in Romania in the near future. At present, most communication between ministries in Romania is handled via print correspondence. The new Communication and Information Technology Ministry, however, has received "Gateway" project funding from The World Bank. A key goal of that project is to establish a single vertical portal to government information and services; this one-stop shop will

provide links to all Ministry home pages. A pilot project will be initiated with 10 ministries to devise appropriate policies and procedures (the RAND research team has urged the MFA to take part in the pilot effort); when the system is fully functional, the remaining ministries will be included. Although the pilot project is focused on communications between government and citizens, it will surely stimulate online inter-ministerial communication as a by-product.

On the other hand, email will not likely become a regular avenue for interactions between citizens and government agencies in Romania for some time to come. At present most Romanians do not have Internet access at home, in part because of the very high cost of telephone line usage. RomTelecom is the only provider of fixed telephone service, and it does not offer any flat rates; per-call charging is in place for all local calls, and even international telecommunication providers (e.g., MCI or AT&T) can only be reached through RomTelecom, accruing RomTelecom local charges for the duration of those calls. Mobile telephony providers have stepped in to offer competitive and reliable services. They have not yet been able to solve the "last mile" problem for potential home-based Internet users, for many of whom the plethora of cybercafes provide a partial answer.

As a final note, the role that RomTelecom might play--if any--in the development or use of the MFA's envisioned future ICT (either internally or to connect it with external communication partners) deserves careful attention. At present it is a monopoly provider in transition to privatization, and its service charges are very high. Full privatization is slated for completion by 2003. It is difficult to anticipate just how, if at all, full privatization will affect its prices or services. However, a great many other providers are already gearing up to enter this market.

TECHNOLOGY ISSUES AND QUESTIONS

Needless to say, the preceding overview does not do justice to the variety of ongoing ICT-based activities or future ICT needs of the MFA's multiple constituencies. At most it provides a general sense of the

present state and lays some groundwork for considering the issues and questions that follow.

Physical/Geographic Constraints on Connectivity

As the foregoing accounts indicate, the divisions that constitute the MFA at present inhabit separate buildings, and even within buildings local connectivity is limited by lack of outlets. It is widely believed that within 1-2 years all the divisions of the Ministry will be moved to a single building that can house them together. The kinds of renovations usually undertaken in the course of such a move could include ample wiring that would meet present and anticipated future needs for network access.

It is undoubtedly a good idea that plans for any future physical move should anticipate ICT infrastructure requirements and take them into account. On the other hand, it would be a bad idea to delay implementation of full connectivity for the MFA until the time when all its units are colocated in the same building.

Rather, the new information and communication system should be designed to be as independent as possible of assumptions about the physical location of its users (a critical advantage of digital communication and information sharing is its ability to overcome geographic constraints!). Treating this principle as basic will result in a system that can survive future changes in division/ministry affiliation or housing; it should also promote ease of interaction with foreign missions as constituents of the internal MFA community.

In any case, the ICT modernization project needs to identify and assess the viability of multiple options (and mixes of options) for providing full connectivity to all internal communication participants in the near future as well as in the longer term. Options may include, for example, optical fiber, TV cable or satellites, or wireless connections, as well as leased and regular phone lines; for longer distance communications, ISPs that support virtual private networks (VPNs) and voice-over-IP should be considered as well. In the near term, for instance, leased phone lines might be used to create connectivity for divisions presently housed in separate buildings with

no network access; wireless media might be used to support within-building connectivity where physical network access is now lacking; and so on. Most software programs developed to support a Ministry-wide communication system (e.g., individual email addresses, group lists, directory services) should be largely portable across different network media and useful within any new building.

ISPs, Internet Access and Email Software

The preceding technology overview indicates that, even though they are in differing stages of technological progress toward that goal, all divisions of the Ministry value highly the capability for their employees to communicate internally and externally by email and to make use of intranet and Internet Web facilities. Enabling full connectivity would go a substantial part of the way toward realizing these objectives. Another major piece of the solution involves systems and software.

Presently the three different ICT ecologies within the Ministry (summarized above) rely on three different ISPs, use different email software, and have no common platform of support for easy internal communication (e.g., there is no MFA-wide email directory, let alone a "network neighborhood"). These system disconnects stem largely from the disparate origins of the divisions that now comprise the Ministry, and multiple avenues to their resolution should be investigated.

Given that there are three different ICT environments in the Ministry today, it will be important at each step in future system design to determine whether uniformity is important (e.g., is it necessary to go with a single ISP or just one email software) or whether interoperability and harmonization of diverse approaches can yield a feasible and effective approach. In any case, it will be necessary to avoid a strategy that invokes the "lowest common denominator" criticism or otherwise causes technologically more advanced divisions to believe their progress will be held back (or worse, will be degraded) by their association with a Ministry-wide ICT infrastructure. The key questions here should focus first on end-user functionality--what it will take to provide users with, for instance, a cross-Ministry email directory, easy

email communication with all internal communication partners, and easy methods of information sharing with colleagues in the same or other divisions. Then back-end system arrangements for enabling such functions should be explored.

Special Communication Requirements, Standards and Regulations

As explained in the first section of this report, the MFA needs to have two kinds of specially protected communications (in addition to normal needs for information security). The diplomatic divisions often handle communications considered to be "secret." Any such exchanges of information entail special system arrangements. The commercial divisions, on the other hand, want to be able to engage in e-commerce-like interactions, which entail other kinds of security arrangements.

The question here is the extent to which the same hardware and network can serve diverse specialized needs along with ordinary communication needs. Can a virtual private network be provided, for example--an Extranet, in addition to Internet and intranet connectivity? Or will separate systems have to be provided? In part, the answer depends on present requirements and future plans of key external communication partners, such as NATO and the European Union.

Generic and Specialized Software Applications and Tools

What software applications and tools need to be part of the generic ICT environment for the Ministry and integrated with its communication facilities? What specialized applications need to be acquired to support division-specific business processes? More important, what criteria should be used to make these kinds of decisions? These types of technology choices will have to be made very early in the implementation process; presumably they will be incorporated into requests for information and for offers from technology providers.

Previous research on electronic media in organizations suggests the principle of minimum specification should prevail. That is, representative users should have considerable input into decisions about generic tools, and divisions should have as much freedom as possible to choose and implement their specific mission-critical technologies, given

that those technologies have to be integratable with the broader ICT environment of the Ministry. However, end-user divisions are not always well prepared to make such decisions and take the actions required to carry them out effectively.

Hardware

Installation of a basic infrastructure should be given highest immediate priority. The MFA should attempt to obtain government funds or a government-secured loan to get this effort underway. Many interviewees inside and outside of the Ministry pointed out that the MFA is a large distributed organization that creates a diplomatic and commercial presence for Romania in many important capitals; fast reliable communications are therefore critical to all its work.

The MFA is already trying to move toward this objective. An inventory is underway of the minihubs, cables and dedicated lines it will take to fully network all its Bucharest offices and personnel. In addition, about 500 Windows-quality PCs with standard Microsoft Office software will have to be acquired. When the infrastructure is in place, all personnel should be able to use any generic tools to which the infrastructure provides access along with any specialized applications that have been developed to support the business processes in which they are involved.

A final comment may be in order about hardware. There is very little to say about computer equipment, except that the Ministry needs more of it. In short, to quote a RAND briefing on this topic, "Hardware is not the answer. Hardware is the question. Yes is the answer." The point is that there are a substantial number of hardware providers whose products are likely to meet the Ministry's basic infrastructure needs in largely equivalent ways. The Ministry should select hardware providers who are prepared to offer significant discounts. These discounts should be forthcoming, according to many interviewees, in part because of the quantity of computers the Ministry intends to buy and also because it would be seen as a high-prestige customer whose lead might well be followed by other government agencies.

The technology issues and questions raised above should be addressed in two ways. First, as the MFA prepares to release requests for bids to carry out ICT design and development work, it should decide which technical conditions it wants to specify in advance and which might be susceptible to different approaches to be proposed by offerors (e.g., financing might be treated in this way). The Ministry should also consider which elements of the implementation process (see below) to include in such requests. For example, advanced training for Informatics Division staff to maintain new technologies as well as initial training for end-users might be required from offerors, along with maintenance, support and other services. To get an idea of how many providers might be interested and what they are likely to offer, it may be desirable to precede a request for proposals (RFP) with a request for information (RFI); the latter request asks providers to comment both on the substantive content of the request as well as their own capabilities to respond.

Second, it should be noted that the scope of a basic ICT infrastructure project like the one envisioned here will likely require multiple providers (e.g., hardware providers, network providers, software providers, and so on). In such a situation, RFIs and RFPs should indicate that the Ministry will want to deal only with a single contractor; that contractor should provide for overall system integration, with other firms serving as subcontractors to the primary. Such partnerships are common among the IT firms we interviewed in Bucharest, and typically involve both foreign and local technology providers (e.g., local software developers partnering with foreign hardware providers). It is possible to get a guarantee for "credit" from the government (a "sovereign guarantee"). Then it is easier to get long term loans from foreign banks for financing when foreign vendors are involved.

5. IMPLEMENTATION

Prior RAND research relies on a very broad conception of implementation. Briefly, it embraces all the choices made and actions taken from the time of a go-ahead decision for some new technology until the time when the technology has been incorporated into day-to-day work in the organizational context of interest. Those intervening steps may include, for instance, planning, attending vendor demos, choosing specific hardware or software options, modifying and testing applications, delivering training courses, setting up support arrangements, developing user policies and procedures, and so on. In brief, it comprises the processes by which new technologies become embedded in organizational settings.

For purposes of this study, we have assumed that the go-ahead decision for ICT modernization has been made. Accordingly the research team devoted substantial attention to implementation processes, construed broadly as above. Previous sections of this report have described the organizational context and outlined the technology available at present as well as the envisioned ICT. Here we address steps that should be taken to realize that vision.

FIRST STEPS

Some pieces of an implementation strategy are in place. There is a project task force composed of representatives from the varied divisions of the Ministry and headed by a fairly high level professional who is committed to its goals. In principle the task force should function in at least two important ways: first, it should carry out participatory design and development activities (i.e., it should help make system choices, try out and evaluate prototypes, and eventually take part in whatever kinds of user trials or pilot projects that emerge); second, these people should also serve as change agents in their own divisions or departments. In practice, it is hard to know how much time and effort task force members are willing or able to give to the ICT

modernization project. It is also hard to know whether the project will have access to sufficient technical manpower even at the planning stages, given that Informatics Division members are already fairly heavily burdened with regular work. And it is difficult to know whether any key stakeholders who ought to be represented are missing from the group. Careful consideration should therefore be given to assuring that an appropriately constituted task force is in place to begin the transition to the next stages of ICT modernization.

Next, in consultation with its ICT modernization task force, the Ministry needs to decide on a plan of action for accomplishing those stages (see also Annex 1). For this purpose, it is helpful to think of the implementation work as consisting of two big parts: developing the infrastructure that will put a networked PC with Internet access on everyone's desk and provide a basic set of tools for information intensive work; and implementing applications and facilities that enable or improve specific kinds of mission-critical business processes. Efforts in the latter category can be treated as "projects" and should be designed (where possible) to attract e-government or other kinds of project funding from sources external to the Ministry. Having an infrastructure in place or well underway would do a great deal to convince potential funders that the MFA will be able to accomplish the projects it proposes.

Further, it is important that users' needs be taken into account from the very start of implementation planning. Previous RAND studies have found that often implementation efforts focus on the technology per se, giving little attention to smoothing the transition for users. Training and technical assistance are, to be sure, key elements but not the only ones that bear on successful implementation from the user perspective. At the outset, for example, it is important to come to terms with critical mass issues. Even in the first wave of implementation, there will have to be a sufficiently dense community of users to get any sense of what is working and what is not, as well as to keep users motivated. Project planners should also think about ways to assist user units in the redesign of their information- and communication-based tasks, when appropriate, in order to take advantage

of new software and network capabilities. Additionally they may have to help users develop the work-arounds that are sometimes required to support ongoing interactions between the parts of an organization where the new tools are available and the parts where these tools have yet to be installed. These kinds of considerations suggest the advisability of making the basic infrastructure and generic tools (part one of the implementation effort, as described above) available to everyone within as short a time frame as possible.

On the basis of implementation plans like those set out above, critical next steps are to determine the financial and human resources necessary to acquire, install and support the desired system and find ways to get them. With respect to financial support, it would be highly desirable to get a system-based budget commitment that goes beyond a single fiscal year and that encompasses the full basic ICT infrastructure, in order to avoid stalemates of the sort described in the commerce-oriented divisions (where Web design and content had been largely completed but funds for equipment, programming and maintenance were lacking). However, a staged approach to implementation means that committed funds do not all have to be in hand at the beginning.

Concurrently, the MFA must find ways to fill its immediate human resource needs for ICT modernization. As a start, the Informatics Division will have to be expanded greatly in size. Its senior professionals are highly competent but too few in number to take on any new efforts, let alone an effort as ambitious as that entailed by ICT modernization. Many interviewees in both government and industry told us that Romania's higher education system produces graduates strongly skilled in all areas related to computer science and information systems. The Ministry, however, is likely to be competing with the private sector, where higher salaries are paid. As an incentive, interviewees suggested that in its recruitment procedures the Ministry should underscore its prestige as an employer and should emphasize as well the opportunities that would emerge to work in other capitals as implementation activities expand to incorporate connectivity with foreign missions.

Reorganization of the Informatics Division is also a priority. Because the commerce-oriented units now lack technical support, the Informatics Division needs the authority and other required resources to furnish the Department of Foreign Trade and International Economic Cooperation with the same kinds of services and support it provides to other MFA departments (even though the former units are, as explained above, located some distance from the latter). The special status of the Foreign Trade Center (being partly independent of the MFA) presents institutional barriers to reorganizing into a single comprehensive informatics unit; however, the MFA's Informatics Division should coordinate its efforts closely with its counterpart in the FTC. Further, it would be desirable to elevate the status of the Informatics Division within the Ministry and have it report to a high-ranking official. Such a change would send a strong positive message about the significance of advanced information and communication technology for carrying out the Ministry's critical missions in the 21st century.

Bringing contemporary worldwide communication and information technology into the Ministry will be complex and challenging, and will require sustained effort and energy. The Ministry must make sure that it has a project team in place with the commitment and capability to see it through. A project leader with an enterprising spirit and can-do attitude--along with strong technical competence--should be named, and ideally a high-level champion (e.g., a state secretary) for the project should be found. The project leader and team need to be empowered to make and execute certain kinds of day-to-day project decisions (e.g., decisions that fall below pre-specified funding levels or that carry out in specific ways more general decisions already approved at higher levels). Moreover, the project leader (or a designated alternate) should be asked to serve as Chief Information Officer (CIO), acting as the single point of contact for ICT-relevant information within and outside the MFA. It is important not to underestimate the role that effective project management can play in implementation success. For this reason, project management skills should be encouraged and supported in the MFA throughout the ICT modernization effort.

Moreover, as the first sets of users get access to an infrastructure that enables organization-wide email and digital document exchange as well as access to intranet and Internet facilities, it is desirable to begin articulating Ministry policies and procedures for preparing and sharing such information. What kinds of materials are to be considered official (rather than informal or unofficial), for instance, and how should they be handled? Should official materials of particular types (e.g., Infograms) be prepared using standardized word-processing templates and naming conventions? Should they be stored in pre-defined folders where they will be automatically registered and rendered retrievable for accountability purposes as part of the MFA's electronic archives? And who should be responsible for assuring that these things happen?

Many such questions about policies and procedures will accompany the introduction of networked digital media into the Ministry's day-to-day work practices. Further, most of them cannot be answered appropriately apart from contexts of practice. For instance, many organizations have attempted to build into the distribution of electronic documents the same kinds of hierarchical rules that characterized their previous circulation of paper documents. Not only do such policies inevitably prove futile (all organizations can anticipate a burgeoning of horizontal interaction once networked information and communication facilities are installed), when they are heeded they preclude the business process efficiencies that networked interactions are designed to promote. In general, viable procedures for assuring appropriate authorization and distribution are more likely to emerge from users' experiences with networked tools than from attempts in advance to mirror paper-based approaches in digital environments. For this reason, the drafting of new policies and procedures should only be undertaken commensurately with the introduction of the basic ICT infrastructure.

Last, a very high priority should be given to exploring and recommending actions that can be taken now, even before all the needed financial and human resources are in place, to move forward with ICT modernization. For instance, it is possible to provide all professional

employees with standardized email addresses (even before they all have computers with network access), so long as messages are automatically routed to a near-by printer. It is also probably appropriate, even now, to build and support email directories that span the entire Ministry, including the divisions that formerly belonged to Commerce. And work should continue to finish the MFA's new external Web site, now under construction, on a timely basis. Presumably such efforts would be portable to any new ICT infrastructure. In the meantime, however, they would do a great deal to engender optimism and momentum toward phase 2--interviewees in the Ministry already report they are encouraged by the new Web design work underway and look forward to its completion.

BEYOND THE INFRASTRUCTURE

As explained above, the research team recommends an implementation strategy comprising two parts: a basic minimum ICT infrastructure, and a series of projects intended to provide specific business processes with enabling applications and tools. To some extent, this strategy is dictated by necessity--even if all the requisite funding were available, it would not be feasible to implement all the desired functionality at once. But it is also motivated by opportunity--a number of major information technology initiatives are just getting under way or are soon to be introduced that have some relationship to e-government in Romania.

The MFA should stay in close touch with all such initiatives, viewing them as potential sources of support for ICT projects. The following are some illustrative examples.

- The new Ministry for Communication and Information Technology is coordinating the Gateway to Romania project funded by the World Bank (the Bank has similar Gateway projects in other southern and eastern European countries). This large initiative has two orientations, neither of which is fully defined at present.
  - One, sometimes seen as a "front office" orientation, has to do with creating a single major vertical portal to all government ministry Web sites (a kind of one-stop shopping for government information); it will select 10 ministries this year as a pilot group. When the procedures are harmonized and working properly, the remainder of the Ministries will be brought on board. We

have already recommended that MFA make major efforts to be among the first 10 included (see section 3 above).

- The other orientation is more toward the "back office." There is a realization that providing government information on the Web inevitably will create expectations of being able to conduct official interactions with government entities electronically (e.g., filing visa applications online, or getting business licenses); or it may just lead to the expectation that people can ask questions of a government official by email and get them answered. Realizing any of these prospects depends on having a "back office" in place, so that government entities can carry out their missions using digital media. Because these kinds of interactions will differ from ministry to ministry, the role of the Communication and Information Technology Ministry will be to set out an e-development strategy and provide technical consulting. The new Ministry will also have the authority to approve all government IT projects costing over $100,000 USD. The MFA should therefore stay up to date with e-development guidelines and align its project plans with them.

o A major needs assessment, called Internet for Economic Development (IED), was undertaken in Romania with US/AID in the lead. That assessment is being used as a guide by the Gateway project. In the meantime, US/AID is coordinating a task force that is charged with thinking about next steps. In particular, US/AID will give grants to fund IT projects independently of Gateway. The MFA's US/AID task force representative should stay close to this effort and alert the MFA's ICT project team as soon as the call for project proposals is released.

o Both the World Bank and UNDP will probably be ready to fund e-government projects by the end of the 2001 calendar year; in the UNDP, such activity would come under its governance program while in the World Bank, relevant initiatives separate from Gateway will fall under its Action Plan for Business Environment Improvement. Again, the MFA would be well advised to track these possibilities and respond to calls for proposals.

o The EU has an action plan for e-Europe and e-Europe+ (the latter directly concerns accession countries). Romania is already participating in some e-Europe fifth framework programs that fund demonstration projects involving innovative uses of information technology (Romania will be involved in sixth framework e-Europe programs as well). Model projects related to public administration reform would be fundable under those programs, but they would have to be coordinated by the EU Integration Ministry; and the EU generally requires multiple participants (proposals should, for instance, involve multiple ministries in pilot projects).

o EU/PHARE is another potential source of funds for ICT projects, but the next opportunity to submit proposals will be early in 2002. The first step should be the preparation of a concept proposal (about a page and a half) that outlines key goals. If the concept proposal is on track, PHARE can provide technical assistance to develop it into a full proposal (PHARE has a model to follow for full proposals). The full proposal should be a joint submission

by the MFA along with the MCIT and the Public Administration Ministry.

There are probably possibilities for attracting funds from bilateral donor countries as well. The point of the preceding list is to make clear that there are, and will likely continue to be, opportunities to attract funds for projects once an ICT infrastructure is in place. While the infrastructure is being built, the Ministry should prepare and prioritize a portfolio of modular project-sized initiatives that could be turned into proposals; the proposals need to be comprehended under an overarching ICT strategy and management model that will assure that, although they are undertaken separately, they can all be integrated.

Further, any Ministry project proposals will need to include attention to two key points. One is business process improvement--the language of business "solutions" is intended to convey the point that project funders do not want to see requests for technology per se. They want to see significant improvements to mission-critical Ministry processes outlined first, and then the software and hardware that would enable these improvements. A second point is that any Ministry proposal must be cognizant of what is going on in other ministries; there is a lot of talk about reducing duplication of effort and about learning from what others have accomplished. So the Ministry should also stay in touch with ICT initiatives underway in other government institutions in Romania. Cooperative projects with other ministries, where feasible, would be especially well received.

Finally, because external funding initiatives may have a significant part to play in supporting its ICT modernization, the Ministry may want to consider bringing on board a consultant who could give a considerable amount of time over the next year or two to staying in touch with project opportunities and preparing responsive project proposals. Additionally, the Ministry should think carefully about how best to guarantee overall technical coordination for the development of a generic infrastructure and for embedding in such an infrastructure multiple mission-oriented applications and tools that, at the end of the day, will have to interoperate.

6. CONCLUSIONS AND RECOMMENDATIONS

Preceding sections of this report discuss descriptive material, findings, and suggestions for ICT modernization in relation to the MFA's organizational context, technology, and implementation strategy. Here we first present the study's top level conclusions. Then we provide more detailed results and recommendations, emphasizing technology and implementation considerations that might be useful contributions to future requests for information (RFIs) or requests for proposals (RFPs) that the Ministry may issue to private sector offerors potentially interested in taking on ICT system design and development (see also Annex 1).

MAJOR CONCLUSIONS

The common wisdom is that few problems can be solved by throwing money at them. The problem this report addresses is an exception to that general rule. Simply put, the MFA lacks sufficient hardware and connectivity on which to base improvements to its information and communication systems. This lack can be remedied with technologies presently available on the market, so long as financing can be arranged. Without access to contemporary technologies, it is hard to envision any significant performance improvements in the MFA's information- and communication-intensive missions. However, a well designed ICT infrastructure will serve as the base within which powerful business solutions can successively be embedded as implementation progresses.

If funding were available, human resource limitations would not constitute a major implementation obstacle. Professional MFA employees do not show reluctance to use new computer-based media. Rather, across varied divisions employees stressed the need for more and better on-line tools. Further, the senior professionals in the Informatics Division are well trained and have a strong command of English as well as strong technical skills. Given the funds, it should be possible to increase the size of the technical staff to the level that would be required to

maintain a larger and more advanced information and communication system.

Finally, the first-phase RAND effort reported here has raised hopes—it seems to be attracting a notable amount of professional commitment and energy. People in the Ministry think of advanced ICT as helping their effort to build links to Western governments and economies. On the other hand, a 1998 modernization effort ended in a well-done report with no follow-up action; it would be extremely discouraging for the current project to come to a similar end. So even before all the pieces of a solution to the ICT modernization problem can be worked out, it is very important to end this first-phase project with at least some viable action items—steps that can be taken by the Ministry in the near term that would make a positive difference. This conclusion may, of course, lead back to the first point about financing.

RECOMMENDATIONS FOR TECHNOLOGY IMPLEMENTATION

The recommendations that follow are drawn from all three substantive sections of this report. However, they emphasize what must be done in the near term to implement a basic contemporary information and communication technology infrastructure.

1. Information acquisition, analysis and dissemination, together with communication, are critical business processes of the MFA that require much stronger enabling technologies in the immediate future.

Throughout our visits to offices of the MFA, we observed the primary role of documents--both informal and formal (signed). Such documents were passed from office to office for coordination, and communicated (by email or regular mail) to other offices both within Bucharest and over 130 Romanian embassies, consulates, and special offices. Much of the current document handling is manual, based on paper. Many of the MFA office staff do not yet have networked personal computers (PCs) on their desktops for communicating by email easily and for receiving and sending documents electronically. Consequently, much time is spent carrying floppy disks and passing paper among offices.

2. The MFA should begin immediately to install a metropolitan area network (MAN) linking all its Bucharest buildings and offices. Goals of this development should include:

   * Providing a personal computer (PC) for every user, plus a standard software suite;

   * Providing standard individual email addresses, plus Internet and intranet (within the MAN) access for all (supporting the growth of a digital culture within the Ministry while enabling routine electronic exchange with external entities that are Internet-accessible);

   * Acquiring tools that will support the modular incremental development of high-priority applications, such as:

     - a standard SQL database in which payroll, accounting, and personnel systems can be implemented;

     - a document management system that will permit implementation of shared files, electronic records, and archives.

The offices of the MFA are scattered among several buildings throughout downtown Bucharest. The problem is exacerbated by the recent inclusion of the Department of Foreign Trade and International Economic Cooperation within the MFA; formerly part of another Ministry, it is located over a kilometer away from the main MFA buildings. Different MFA offices currently use differing Internet service providers, leading to differing naming conventions for email addresses for office staff within MFA.

It is now commonplace to link distributed offices such as MFA's within what is known as a "metropolitan area network" (as distinguished from a "local-area network" within a building, or a "wide-area network" spanning a country or among internationally distributed offices). Such a network uses leased (dedicated) communication lines among those buildings to network them together, so that they appear as one network. Within the MAN, users can send email, distribute electronic documents, and access common shared files. Users of the MAN should have email addresses based on a common addressing format, so that they are easily understood (or readily guessed) based on a standard naming convention.

Once many digital documents are being shared among various offices of the MFA, the problem arises of document management: determining which version of a document is the current one; searching digitally for a document and locating it; archiving documents so that they may be

accessed later; and so on. Software for such activities is available to aid in these activities and processes.

Some of the data-oriented processes within the MFA are quite regular and similar to those within private commercial companies, such as payroll, accounting, and personnel systems. During our investigation, we interviewed one example Bucharest company (Siveco) providing such software--although there are undoubtedly others. This visit convinced us that data handling software is available for tailoring, installation and support within Bucharest to meet needs such as those of MFA. Such systems now tend to be based upon relational database management systems (RDBMS) such as those of Oracle or Sybase, which are very flexible in their data storage schemes, allowing new applications and specialized queries and reports to be generated as needed quite easily.

3. Concurrently, the MFA should undertake a pilot project with a wide area network (WAN) linking its headquarters to some foreign embassies or missions. Recommended steps in this process are:

   * Start by selecting a small number of key foreign offices that represent heavy communication needs and costs (e.g., Washington DC, Brussels) and where international connectivity is in principle available now;

   * Introduce a virtual private network (VPN) that will tunnel through the Internet. This allows transparent access to all the facilities for information and communication that are available in the headquarters for interaction with employees in field offices. The VPN facility will also support voice-over-IP (VoIP) for international telephone calls, yielding potentially significant telecommunications cost savings while affording secure avenues for official information exchange with communication partners outside the reach of the headquarters MAN.

   * Conduct special training with expected users (e.g., within the Minister's Cabinet, and members of relevant divisions such as the EU unit, the North American unit, and the NATO unit).

   * Devise an evaluation plan and measures in order to learn important lessons from the pilot, including:

     - what it takes to install and support connectivity with a remote site;

     - technical feasibility (e.g., adequacy of voice quality) of voice-over-IP for voice communications;

     - level of security provided for sensitive (but not classified) communications;

- economic factors, such as costs of installation, use and support, plus cost savings compared with traditional means of communication via phone, fax, and other media;
- how to make realistic schedules and future plans for linking future sites.

A major component of the information and communication requirements of the MFA involves sending messages and documents to, and from, over 130 foreign offices/embassies/consulates supported by the MFA. The telephone charges for MFA voice calls and faxes to and from these offices are very expensive, amounting to hundreds of thousands of dollars per year. We believe there are potential cost savings here that might be applied to the provision of more desktop PCs and the MFA WANs, MANs and LANs described above. We propose an initial pilot project in which several key remote sites that generate considerable communication traffic (e.g., several offices in Brussels and in Washington DC) be configured so that they are capable of sending and receiving voice (telephone) calls, in addition to email and document transfer, via the Internet. This is done by subscribing to a virtual private network (VPN) that "tunnels" encrypted communications through the Internet. Such VPN services are currently provided by a number of international communication companies with offices in Bucharest, such as GlobalOne and KPNQwest.

Remote offices participating in this pilot project could be configured in one of two ways:

(a) Their telephones would be wired to a private branch exchange (PBX) within the embassy, consulate or office. That PBX, in turn, would be wired to an Internet router. In this option, calls placed from telephones in the normal manner would be converted (within the router) into digital signals that are encrypted and sent through the Internet. The process is reversed on the other end.

(b) A local area network is created within the embassy/consulate/office, and "Internet phones" are directly tied to this LAN. The LAN, in turn, contains a router that interfaces communications with the Internet. This option saves the expense of a PBX, but requires special telephones that use LAN protocols such as Ethernet and the Internet Protocol directly.

In either of the above two options, PCs within the foreign missions would of course also be connected to the office LAN, so that electronic messages could be sent or received directly, and faxes could be sent and received from the desktop PCs.

The cost savings from these developments could be significant, and could help pay for other needed information system upgrades within the MFA. However, we emphasize that benefits from this electronic communication would only be fully realized if employees within the MFA offices in Bucharest have desktop PCs linked to LANs, MANs and WANs so that they can generate, send, and receive electronic messages and documents as part of their normal work activities.

An additional benefit of using VPN and VoIP is greater security for routine office transactions to remote sites. All VPN communications are encrypted, so that all email, all electronic documents, and all faxes and telephone calls transmitted in this manner have a substantial amount of encryption to foil eavesdropping on their content. They would therefore have considerably more security than current telephone calls and emails exchanged with remote sites. (Note: We are excluding from this discussion special classified communications to remote sites, which are handled separately, including those using encrypting fax machines. Those are managed by The Division for Special Communications, and we were not able to meet with them to discuss their needs and special requirements.)

Training and education in the use of these new facilities would be a vital part of the pilot project, and should be integrated into planning and budgeting from the beginning. It is also important to obtain maximum benefit from this pilot by creating an evaluation plan that monitors costs and benefits. It would then be possible to use the data obtained to create accurate estimates of the costs and benefits from expanding VPN and VoIP services to other MFA remote sites.

We note, however, that it is unlikely that the VPN + VoIP communication strategy would be best for all remote offices supported by the MFA. Some sites would have insufficient communications to justify the expense. Some sites may not have local Internet connections of adequate bandwidth and reliability. If the pilot is successful, a study should be made of which additional sites are candidates for extending VPN + VoIP services.

4. All these networked information and communication systems are expected to be both scalable and extensible, evolving gracefully to meet future needs. For example:

* At any point in time, the network will be heterogeneous, permitting multiple solutions to the same communication problem;
* Generic systems and tools will be compatible with future Romanian government plans to implement electronic signatures ("e-signatures") and other facilities for e-government or e-commerce transactions. (These facilities will most likely be based on public key infrastructure (PKI) technologies.)
* These systems, tools and facilities should also be possible to integrate with any initiatives related to the Gateway project of the new Communication and Information Technology Ministry.
* Finally, the established MFA infrastructure and digital communication culture will support its own specific internal needs in the future as viable technologies emerge in the Romanian market. (One example might be broadband-based video teleconferencing.)

As mentioned above, the needs of various MFA offices vary greatly. One solution is not appropriate to all the diverse sites. The pilot project we propose is designed to scale gracefully up as far as appropriate, but it is not necessary that all offices simultaneously upgrade to interfacing with LANs, MANs, and VPN + VoIP provided by a WAN.

We are also aware that the Romanian government is in the process of passing legislation allowing use of "digital signatures" for electronic documents. We expect that a "digital certificate" authority will be established within the Romanian government specifically for government use. All the recommendations in this report are compatible with use of digital signatures based on such public key infrastructure (PKI) systems. With greater Internet access to/from the MFA, many "e-government" initiatives should become possible, such as the ability to apply for and receive export/import licenses online (the application part of this procedure is possible now) and to send signed, legally binding documents electronically that represent the license that was granted. Such processes will save considerable time and paperwork, making import/export procedures considerably more efficient and providing access to them from anywhere within Romania and other countries around the world.

5. There are sufficiently competent companies based in Romania to provide the required technical services and support. There is, however, a great need to increase the capacity of the MFA's Informatics Division.

* The Informatics Division needs more people with advanced training in information/communication technologies;
* The Informatics Division needs to be more highly placed within the MFA's organizational structure, and to receive significant support from all high-level managers;
* A strong ICT project team will be required to carry out the efforts described here;
* An internal employee or external consultant with strong writing skills may be required to:
  - help develop an MFA request for information (RFI) and subsequent request for proposals (RFP) for the envisioned work;
  - prepare proposals for specific ICT projects expected to be funded in the near future by varied donor organizations, such as US/AID, UNDP, and the World Bank.

During the course of our study, we visited a number of key software, network, and system integration companies within Bucharest. We were impressed by the professionalism, knowledge, and ties to major suppliers of hardware, software and telecommunications (e.g., Microsoft, Compaq, Cisco, Omnilogic BGS, Global One, KPNQwest, various Internet Service Providers (ISPs) exhibited by these companies. It is clear to us that there is abundant talent within the private sector in Romania to supply all the capabilities (hardware, software, systems integration, documentation, and education and training) required by our recommendations.

Finally, as a geographically distributed organization with world-wide missions and as a leading agency for Romania's integration in Euro-Atlantic institutions, the Ministry of Foreign Affairs cannot expect to continue meeting its goals and objectives effectively without 21st century technology. Moreover, current developments in the Romanian government (e.g., a new Ministry for Communication and Information Technology, a parliamentary committee on e-legislation, a president who has made information society advancement one of his top three priorities), together with ICT-related programs and initiatives supported by major nongovernmental organizations with representation in Romania, are strikingly convergent indicators that this is the right time for the MFA to move forward aggressively on its modernization agenda. The foregoing recommendations (along with the Action Plan outlined in Annex 1) are intended to serve that end.

BIBLIOGRAPHY

Anderson, R. H., P. S. Anton, S. C. Bankes, T. K. Bikson, J. Caulkins, P. J. Denning, J. A. Dewar, R. O. Hundley, and C. R. Neu. The Global Course of the Information Revolution: Technical Trends, RAND, CF-157-NIC, 2000.

Anderson, R. H., P. M. Feldman, S. Gerwehr, B. Houghton, R. Mesic, J. D. Pinder, J. Rothenberg, and J. Chiesa. *"Securing the U.S. Defense Information Infrastructure: A Proposed Approach"*, RAND, MR-993-OSD/NSA/DARPA, 1999.

Anderson, R. H., R. Brackney, and T. Bozek. *"Advanced Network Defense Research: Proceedings of a Workshop"*, RAND, CF-159-NSA, 2000.

Anderson, R. H., T. K. Bikson, S. A. Law, and B. M. Mitchell. *Universal Access to E-Mail: Feasibility and Societal Implications*, RAND, MR-650-MF, 1995.

Bikson, T. K. "Groupware at The World Bank," in C. Ciborra (ed.), *Groupware & Teamwork*, Somerset NJ: John Wiley & Sons, Inc., 1996, pp. 145-183. (The Italian version is available as "Sistemi di Supporto alla Decisioni di Gruppo nella Banca Mondiale," in C. Ciborra (ed.), *Lavorare Assieme*, Milano: RCS Libri & Grandi Opera S.p.A., 1996, pp. 161-207.)

Bikson, T. K. "It's More than Screen Deep: User Perspectives on the Interface to Electronic Communication," *Proceedings of the Symposium on Computer Supported Cooperative Work: New Perspectives,* Toronto: Computer Science Research Institute, 1991.

Bikson, T. K. "Managing Digital Documents: Technology Challenges and Institutional Responses," in *Proceedings of the International Conference of the Round Table on Archives*, Stockholm, Sweden: International Council on Archives, September 1998. (The French version is available as, "Gestion des Documents Numeriques: Defis Technologiques et Reponses des Institutions.")

Bikson, T. K. "Organizational Trends and Electronic Media," *American Archivist* Vol. 57(1), 1994, pp. 48-68. Also available from RAND as Reprint RP-307.

Bikson, T. K. "Understanding the Implementation of Office Technology," in Robert Kraut (ed.), *Technology and the Transformation of White Collar Work*, Hillsdale, NJ: Erlbaum Associates, 1986, pp. 155-176. Also available from RAND as Reprint N-2619-NSF.

Bikson, T. K. *Roadmap to Electronic Document Management in United Nations Organizations*, Geneva: UN Information Systems Coordination Committee (ISCC), ACC/1997/ISCC/5, 1997.

Bikson, T. K. *Strategies for Implementing Document Management Technology*, Geneva: UN Information Systems Coordination Committee (ISCC), ACC/1997/ISCC/4 - Annex II, 1997. Also available from RAND as Reprint RP-704.

Bikson, T. K. and C. Panis. *Citizens, Computers and Connectivity: A Review of Trends*, RAND, MR-1109-MF, 1999.

Bikson, T. K. and E. J. Frinking. *Preserving the Present: Toward Viable Electronic Records*, "Den Haag: Sdu Publishers, 1993. (Parts of this book are available as RAND Reprint RP-257.)

Bikson, T. K. and J. D. Eveland. "Sociotechnical Reinvention: Implementation Dynamics and Collaboration Tools," *Information Communication & Society* (iCS), Vol. 1 (3), 1998, pp. 269-289.

Bikson, T. K. and J. D. Eveland. "The Interplay of Work Group Structures and Computer Support," in J. Galegher, R. Kraut and C. Egido (eds.), *Intellectual Teamwork*, Erlbaum Associates, Hillsdale NJ, 1990, pp. 245-290. Also available from RAND as Reprint N-3429-MF.

Bikson, T. K. and J. D. Eveland. *New Office Technology: Planning for People*, monograph, Work in America Institute's Series in Productivity, New York: Pergamon Press, 1986.

Bikson, T. K. and R. H. Anderson. *E-Commerce: A Revolution in the Making for Consumers, Firms, and Nations*, RAND, P-8032, 1998. (This paper was prepared for publication in the Italian cultural journal "IF," Vol 6 No 3 (December 1998), under the title "La rivoluzione dell'e-commerce.")

Bikson, T. K. and S. A. Law. "Electronic Information Media and Records Management Methods: A Survey of Practices in United Nations Organizations," *The Information Society*, Vol. 9(2), 1993, pp. 125-144. Also available from RAND as Reprint RP-508.

Bikson, T. K. and S. A. Law. "Electronic Mail Use at the World Bank: Messages from Users," The Information Society, Vol. 9(2), 1993, pp. 89-124. Also available from RAND as Reprint RP-501.

Bikson, T. K., J. D. Eveland, S. Cohen, and D. Mankin. "Knowledge-Based Teams: Technology, Reinvention and Critical Process Redesign," in G. Salvendy, M. Smith, and R. Koubek (eds.), *Design of Computing Systems: Cognitive Considerations* (*Advances in Human Factors/Ergonomics*, Vol. 21A), Amsterdam: Elsevier, 1997, pp. 205-209.

Bikson, T. K., S. Cammarata, S. A. Law, and T. West. *UN UNESIS Phase I Report: Plans for the Progressive Implementation of UNESIS*, RAND, DRR-910/4-UN, 1995.

Bikson, T. K.,, S. G. Cohen, and D. Mankin. "Teams and Information Technology: Creating Value Through Knowledge," in E. Sundstrom (ed.), *Supporting Work Team Effectiveness: Creating the Context for High Performance*, San Francisco: Jossey Bass, 1998, pp. 215-245.

Botterman, M., T. K. Bikson, S. Bosman, J. Cave, E. Frinking, and V. dePous. *Public Information Provision in the Digital Age: Implementation and Effects of the US Freedom of Information Act*, Den Haag: Sdu Publishers, 2000.

Cammarata, S., S. A. Law, T. K. Bikson, T. West, and E. Frinking. *UN UNESIS Report: Executive Summary*, RAND, DRU-911-UN, 1995.

Hundley, R. and R. H. Anderson. *"Emerging Challenge: Security and Safety in Cyberspace."* RAND, RP-484, 1996. Originally published in IEEE Technology and Society Magazine, v. 14, no. 4, Winter 1995-1996.

Hundley, R. O. and R. H. Anderson. *"A Qualitative Methodology for the Assessment of Cyberspace-Related Risks"*, RAND, P-7988, 1996.

Hundley, R. O., R. H. Anderson, J. Arquilla, R. C. Molander. *"Security in Cyberspace: Challenges for Society: Proceedings of an International Conference"*, RAND, CF-128-RC, 1996.

Hundley, R. O., R. H. Anderson, T. K. Bikson, J. A. Dewar, J. Green, M. Libicki, and C. R. Neu. *The Global Course of the Information Revolution: Political, Economic, and Social Consequences*, RAND, CF-154-NIC, 2000.

Law, S. A., T. K. Bikson, and E. Frinking. *UN UNESIS Phase I Report: User Requirements Study*, RAND, DRR-910/2-UN, 1995.

Mankin, D., S. Cohen, and T. K. Bikson. *Teams and Technology: Fulfilling the Promise of the New Organization*, Boston MA: Harvard Business School Press, 1996.

Mankin, D., S. G. Cohen, and T. K. Bikson. "Teams and Technology: Tensions in Participatory Design," *Organizational Dynamics*, 1997, pp. 63-76.

Neu, C. R., R. H. Anderson, and T. K. Bikson. "E-Mail Communication Between Government and Citizens: Security, Policy Issues, and Next Steps," RAND, IP-178, 1998,
URL: http://www.rand.org/publications/IP/IP178/.

Neu, C. R., R. H. Anderson, and T. K. Bikson. *Sending Your Government a Message: E-Mail Communication between Citizens and Governments*, MR-1095-MF, 1999.

Rothenberg, J. and T. K. Bikson. *Carrying Authentic, Understandable and Usable Digital Records Through Time*, Den Haag: Sdu Publishers, 1999.

Stasz, C., T. K. Bikson, J. D. Eveland, and B. Mittman. Information Technology in the U.S. Forest Service: An Assessment of Late Stage Implementation, RAND, R-3908-USDAFS, 1990.

ANNEX 1: SUGGESTED OUTLINE FOR AN MFA ACTION PLAN DOCUMENT

In the body of the study report (see sections 4 and 6), we note that development of a request for information (RFI) and/or a request for proposals (RFP) will be an imminent next step in ICT modernization progress. Preparation of such materials is itself a fairly labor-intensive effort because, if they are not well done, responses are likely to be misleading or unhelpful if they are forthcoming at all.

The Ministry has senior professionals in its Informatics Division who could specify the technical content for an RFI or RFP, if they could off-load some of their present tasks. The Ministry might also be able to speed the RFI/RFP preparation process by enlisting the services of an employee or a consultant with strong writing skills to develop the less technical contents of such requests. Regardless of how the procedure is handled, it might require access to funds not in the Ministry's current budget.

The document outlined below is intended to serve two purposes. First, as a representation of the Ministry's plan of action, it might help to get funds released to support the RFI/RFP preparation process. Second, much of what is suggested for inclusion in this document would constitute directly useful components of an RFI or RFP.

I. Introduction: The introduction should emphasize the strategic role for ICT modernization in the MFA--that it is critical to the successful conduct of the Ministry's primary business processes today and especially so in the near term future.

   A. Key goals and objectives of ICT modernization

   B. Summary of the overarching system strategy for reaching these goals and objectives

   C. Current status and progress of ICTs in the Ministry

II. Functional requirements for the needed system

A. Basic infrastructure for fully networked information and communication activities within MFA's Bucharest-based units

B. Significant further developments needed

1. Pilot project with VPN connectivity and voice-over-IP to a subset of foreign missions

2. Installation of a relational database to support specialized applications (e.g., financial, human resources)

3. Document management system (version control, registration, storage and retrieval, archiving and back-up) interfaced with commonly used word-processing applications

4. Tools (e.g., templates, encryption, electronic signatures) and procedures for sending official documents by email

5. Tools and procedures that enable applying for and receiving export or import licenses online

6. Online intranet/Web-based forms for frequent and routine administrative processes (e.g., travel orders), with automated processing to the extent feasible and regular reports generated automatically for management review and for recordkeeping and accountability purposes

7. Automated intelligent searching and retrieval of information from databases on the Web related to foreign trade laws and regulations in countries with which Romania wants to have trade relationships; and semi-automated posting of updated information to the commerce divisions' Web pages for use by interested Romanian businesses

8. Collaborative work support, providing technologies and applications that enhance group tasks, where group members may be in the same or different locations geographically or organizationally (e.g., different ministries)

9. Building a virtual community of Romanian computer and information scientists and electronics engineers living outside the home country

- Many more project ideas can be generated and tailored to funding opportunities; those listed above are ones that surfaced often in interviews. No contractor should try to take them all on, but some subset should be listed to indicate to offerors what the eventual ICT environment is expected to support.

III. Plan of work

A. The Ministry will fill its immediate human resource and organizational needs for ICT advancement

1. Informatics Division expansion (number and type of positions to be filled)

2. How the Informatics Division will be organized for purposes of ICT project management, who the project leader will report to,

3. What will be done, when, and by whom to prepare and release an RFI and/or an RFP to contractors

B. Final proposals should present offers of work to be done in two phases: a detailed system design and implementation plan, to be approved by the MFA in consultation with the MCIT; and, upon approval, acquisition, installation, software development and integration, testing and other tasks required to carry out the detailed plan.

C. Major components of offerors' proposals are expected to address:

1. Hardware (e.g., approximate numbers of PCs, printers, scanners, laptops; servers; routers; storage media; etc.)
2. Software (e.g., end user tools, network management facilities, database software, APIs, etc.)
3. Services (e.g., VPN and other ISP value-added services; training of end users and technical staff; formulation of draft policies and procedures for digital information handling in the Ministry; business process redesign, technical support/maintenance; etc.)
4. Methods and milestones for evaluating system functionality and performance, with revisions or modifications as needed
5. Detailed schedule, staffing, partnering and budget (including financing options)

D. Getting started

1. Note in advance that making and adhering to any schedule for future progress is dependent on meeting the human resource needs cited in III-A above.
2. General time line for the following events:
   a. Releasing an RFI and/or RFP to potential contractors
   b. Approving a detailed system design and implementation plan prepared by a contractor
   c. Having the basic ICT infrastructure in place, as described in II-A above
   d. Initiating one or more pilot projects that enhance the value of the infrastructure (chosen from a prioritized list of developments like

those suggested in II-B above or from newly emerging opportunities

3. Overall coordination plan (e.g., approach to managing the relationship between the Ministry, the primary contractor and expected subcontractors; handling the liaison with MCIT; managing user involvement in ICT modernization; organizing interactions with other government agencies and NGOs when such entities become involved in aspects of ICT modernization; and the like)

4. Dissemination of lessons learned from the ICT modernization effort as implementation progress takes place (e.g., via the MCIT steering committee, to other ministries' IT units, on the Gateway intranet once it becomes a reality, and so on)

IV. Conclusion: Significance of the Expected Results

A. For the MFA and its critical business processes

B. For the Romanian government, by serving as an innovator and sharing the lessons learned

C. For advancing Romania's capabilities to interact rapidly, effectively and responsibly with important constituencies stakeholders in Western Europe and North America